

City of Santa Fe, New Mexico

memo

DATE: October 30, 2012

TO: Public Utilities Committee

VIA: Rick Carpenter, Water Resources and Conservation Section Manager *RC B1/Bks*
Brian K. Snyder, Public Utilities Department and Water Division Director *BKs*

FROM: Claudia I. Borchert, Water Resources Coordinator *CB*

RE: Climate Change and the Santa Fe Watershed: A Preliminary Assessment

Item and Issue: Climate Change and the Santa Fe Watershed: A Preliminary Assessment

Included in this PUC packet is the executive summary and the table of contents of the *Climate Change and the Santa Fe Watershed: A Preliminary Assessment*. To save resources on a draft report, the rest of the assessment is available on line at www.cityofsantafe or can be provided on a CD upon request.

Highlights of the report:

- Section 2 summarizes the current state of the climate change science for our watershed.
- Section 3 captures the process of the workshop, and the subsequent activities that lead to this assessment.
- Section 4 describes the vulnerabilities of our watershed, grouped by water supply, ecosystem, agriculture/food security, land use/quality of life, energy, transportation, economic, and sociological systems.
- Section 5 is perhaps the most important section because it identifies 1) what can be done to adapt to projected climate change impacts and 2) what activities, and they are numerous, are currently being undertaken throughout the watershed. The list of activities, largely gathered from the public at the workshop is impressive, but likely incomplete.
- Appendices record the content of the presentations given by experts at the workshop and the feedback gathered from the workshop attendees. The expert presentations and other information related to this project are also available on the City's website at <http://www.santafenm.gov/index.aspx?NID=2577>.

Background

As directed by Resolution 2011-17 *A Resolution Directing Staff To Prepare Revisions To The City's Long Range Water Supply Plan For the Governing Body's Review With A Special Emphasis on Climate Change*, staff has been analyzing how projected climate change impacts will affect our watershed in general and water resources specifically. Through the Santa Fe Basin Study, as part of the Bureau of Reclamation's (Reclamation) WaterSMART Program Initiative, the City teamed with

Santa Fe County and Reclamation to hold a public workshop on climate change (March 6, 2012) and produced this preliminary assessment.

The second part of the Basin Study will update the water resources system simulation model (WaterMAPS) to include Santa Fe County water utility and to incorporate information that account for the projected climate change impacts on stream flow, temperature, precipitation and evaporation. The result of the Basin Study will determine to what extent projected climate change impacts will modify the current estimated “gap” between water supply and water demand and whether the solutions from the City’s current Long Range Water Supply Plan (2008) and the County’s 40-year Water Plan are adequate to meet the multiple future water challenges presented by climate change.

Next Steps and Schedule:

November 2012

- Seek comments on assessment from Sustainable Santa Fe Commission, the Water Conservation Committee, River Commission and Santa Fe County Commission
- Finalize assessment
- Issue press release on assessment
- Post final assessment on City’s website

December 2012

- Create a polished flyer based on the assessment’s executive summary
- Seek governing body approval of CDMSmith contract for Part 2
- Circulate final assessment to workshop attendees
- Initiate monthly Climate Change brown bag lunch discussions

January 2013

- Begin Phase 2 work and analysis

August 2013

- Update to PUC on progress

April 2014

- Final draft of region’s water supply plan to PUC, other recommended committees and the City Council for approval, and Board of County Commission, if desired by County staff.

Requested Action:

Staff is seeking any feedback from the PUC on the assessment before finalizing it. Staff can incorporate suggestions submitted through November 26th, 2012.

October, 2012

Climate Change and the Santa Fe Watershed: A Preliminary Assessment

Bureau of Reclamation WaterSMART Program Initiative



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Bureau of Reclamation

City of Santa Fe

Santa Fe County



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Acknowledgments

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List of Abbreviations

Basin Study = Santa Fe Climate Change Basin Study

City= City of Santa Fe

County = Santa Fe County

FDSI = Forest Drought Stress Index

gpdc = gallons per capita per day

NDVI = Normalized Difference Vegetation Index

NMED = New Mexico Environment Department

OSE = New Mexico Office of the State Engineer

Reclamation = U.S. Department of the Interior Bureau of Reclamation

SFWA = Santa Fe Watershed Association

SJC = San Juan-Chama Project

SWQB = Surface Water Quality Bureau

TNC = The Nature Conservancy

USGS = U.S. Geological Survey

WaterSMART = Sustain and Manage America's Resources for Tomorrow

Executive Summary

Climate change is projected to have profound impacts on the Santa Fe watershed. The degree to which we will gracefully weather and adapt to the impacts will largely be determined by the preparations we engage in today. This preliminary assessment, collaboration among the City of Santa Fe, Santa Fe County and the Bureau of Reclamation, investigates how projected climate change impacts may influence some of the key natural and human systems in our watershed. The assessment also explores the adaptive actions that we, as stewards of this watershed, may consider implementing and details many of the ongoing activities that will increase the resiliency of our community.

CLIMATE CHANGE IMPACTS

Climate change has already begun and will continue to worsen. While exactly how the multiple changes will evolve is not totally certain, the experts in the field are confident in projecting, at a minimum, the following impacts to our watershed:

- Increased temperatures;
- Diminished snowpack and earlier spring melt of existing snowpack;
- Reduced stream flow due to greater evaporation rates and water use by plants;
- Earlier stream flow peak (from earlier snowmelt) and dampened peak flows;
- Drier mid- to late-summers;
- More severe and frequent droughts;
- Increased fire activity and risk of catastrophic fire; and
- More intense precipitation events resulting in increase peak storm flows, greater magnitude and frequency of flooding, higher erosion rates, more sediment transported by storm flows.

VULNERABILITIES

Through an interactive, public workshop held in Santa Fe on March 6th, 2011, the community and climate change adaptation experts identified the vulnerabilities of water supply, ecosystems, agriculture, land use and quality of life, energy, transportation, economic, and sociological systems. Even though each of these systems inherently overlaps with others and the boundaries are constructs, the systems approach allows us to focus on the most critical aspect of each. A summary of the vulnerabilities are briefly described below:



Water supply: decreased surface water availability; increased water use; unsustainable groundwater use; storage insufficient to capture storm events; debris flows triggered from catastrophic-fire causing loss of storage capacity; degradation of water quality; more frequent restrictions from Rio Grande Compact; increased competition over resource; less groundwater recharge.



Ecosystems: forests vulnerable to insects, fire, and desiccation; less available water; higher water needs; incursion of invasive species; habitat degradation from storms, flooding, erosion, and lack of water; loss of fisheries, upland forests, and grasslands; post-fire forests being replaced by grasses and shrubs, not the original native trees.



Agriculture: reduction in available water supply; increased crop water demand; greater divergence between highest stream flows and when water is needed for irrigation; increased damage to crop from pestilence, high winds, violent rain storms, and flooding; increased pressure to transfer agricultural rights to urban areas; rural-urban conflicts over water and water rights; failure of genetically engineered crops; reduction in viable grasslands for cattle; livestock reduction and mortality from extreme weather conditions and rising cost of feed; increasing food prices.



Land use and quality of life: increased water needs for green spaces; increase of urban flooding; reduction in quality fishing opportunities; reduction in length of skiing and rafting seasons; diminished hiking, biking, and hunting opportunities due to fire; poorer air quality; increased heat stress in elderly, the infirmed, and infants from higher summer daytime and nighttime temperatures.



Energy: increased competition for water with energy production of water-intensive coal, natural gas and nuclear; less hydropower production; reduction in solar production because of higher temperatures and more air particulates; increased energy consumption during the summer and extreme cold weather events; reduced power and gas reliability during extreme conditions.



Transportation: increased interruptions from dust storms, intense rains, and smoke; failure of infrastructure (paved roads, bridges, culverts, rails) designed for less extreme conditions; more difficult flying conditions under higher temperatures.



Economic: tourism and population growth may decrease if climate conditions are unfavorable (e.g. too hot, not enough snow, smoky); insurance premiums may rise for services impacted by natural hazards; cost of energy and water may increase as each becomes more expensive to acquire and transmit.



Sociological: limited local and regional governmental resources to provide emergency services for increased severe weather events; maladaptation of institutions inflexible to rapidly changing conditions; disruption in cultural identities and traditions.

The value of identifying vulnerabilities lies in finding adaptation actions that will address vulnerabilities and thereby increase the watershed's resiliency. While it may seem daunting to

face the long and sobering list of liabilities, a silver lining exists. First, most of the adaptation actions fall into the “no-regrets” category - meaning that the benefits of the proposed activities render adaption worthwhile, regardless of the future conditions. Second, the Santa Fe community has collectively already engaged in a number of actions that have already increased the ability of our collective watershed- humans included- to respond and adapt to projected changes.

The recommended adaptation activities listed below are limited to those that have not, to some degree, been implemented. Current ongoing efforts are listed in the following section and their continuation is also advised.

RECOMMENDED ADAPTATION ACTIVITIES

- ❖ Improve ecosystem biodiversity.
- ❖ Manage and plan restoration holistically.
- ❖ Design or modify bridges and culverts to handle higher intensity runoff events.
- ❖ Incorporate urban agriculture in water and land use planning.
- ❖ Cultivate climate appropriate crops.
- ❖ Transfer water from agriculture to urban during drought for limited-term.
- ❖ Adjudicate Santa Fe basin water rights.
- ❖ Provide incentives and programs to significantly reduce high water users.
- ❖ Augment potable water supplies with reclaimed wastewater.
- ❖ Increase water storage capacity.
- ❖ Require pervious pavement where appropriate.
- ❖ Decentralize energy infrastructure.
- ❖ Municipalize energy system.
- ❖ Expand water harvesting techniques.
- ❖ Install solar panels over parking lots and elsewhere to reflect heat and produce energy.
- ❖ Establish a climate-change targeted monitoring system.

CURRENT ACTIONS

FOREST THINNING

RECLAIMED WATER USE

RIPARIAN RESTORATION

STORM-FLOW MANAGEMENT

SEED SOVEREIGNTY

WATER SUPPLY PLANNING

EDUCATION AND OUTREACH

LAND PRESERVATION

DROUGHT MANAGEMENT PLANS

EMERGENCY RESPONSE CAPACITY

CONJUNCTIVE USE OF WATER

WATER FOR ECOSYSTEMS

IMPROVED WATER QUALITY

DOMESTIC WELL RESTRICTIONS

LOCALLY-SOURCED FOOD

IRRIGATION EFFICIENCY

URBAN FORESTS

LOCAL AND RENEWABLE ENERGY

ARROYO STABILIZATION

ENERGY-WISE BUILDING CODES

SMALL-SCALE LAND SHAPING

PUBLIC INVOLVEMENT

PRESERVATION OF GREEN SPACES

WATER CONSERVATION

REGIONAL COOPERATION

MONITORING

RANGELAND IMPROVEMENTS

STORM-WATER RETENTION

ART-INSPIRED ACTIONS

AQUIFER STORAGE / RECOVERY

URBAN GARDENING

WATER DEMAND MANAGEMENT

NEXT STEPS

While the recommended adaptations are longer-term goals, the list below identifies small incremental steps that will begin to position our community for the projected future.

- ❖ Develop a GIS-based watershed-wide map for tracking existing action in all sectors or systems. The map will help prioritize the areas where further action is needed.
- ❖ Enhance and use water resources dynamic system simulation model (WaterMAPS) for sound and adaptive water management.
- ❖ Develop and/or coordinate community-inclusive, interagency, intergovernmental, watershed-wide, technical advisory committees that focus on specific sectors or systems. These committees may increase communication and coordination among existing efforts to enhance effectiveness; develop more detailed visions, strategies and recommendations; implement activities; and/or track progress. For best results, these advisory committees need to work closely with existing 'umbrella' organizations like the Sustainable Santa Fe Commission, and other existing planning and emergency groups.
- ❖ Monitor key climate-change impacted parameters (temperature, precipitation, temperature extremes, and storm events) so that the picture of impacts and emerging trends can be identified.
- ❖ Implement the water-related recommendations that will result from the next part of the Santa Fe Climate Change Basin Study.
- ❖ Request that all governmental actions consider the impact of a bill, resolution or contract on mitigation and adaptation of climate change before approval is granted, much as a Fiscal Impact Report (FIR) is used to consider the financial implications of proposed actions.
- ❖ Seek funding opportunities to implement recommendations made in this assessment.
- ❖ Develop comprehensive public education program to teach the community, agency staff, and elected officials about the potential impacts of climate change and provide opportunity for collaborative citizen engagement.